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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte TAKANOBU NISHIDA

Appeal 2009-001598
Application 09/986,987
Technology Center 1700

Decided: October 29, 2009

Before KAREN M. HASTINGS, MICHAEL P. COLAIANNI, and
JEFFREY B. ROBERTSON, *Administrative Patent Judges*.

COLAIANNI, *Administrative Patent Judge*.

DECISION ON APPEAL

This is a decision on an appeal under 35 U.S.C. § 134 from the Examiner's final rejection of claims 1 through 4, 8 through 11, 13, 14, 16 through 19, 22, and 23, which are all of the claims pending in the above-identified application. We have jurisdiction pursuant to 35 U.S.C. § 6.

We AFFIRM.

STATEMENT OF THE CASE

The subject matter on appeal is directed to an ashing method. Claim 1 is illustrative:

1. An ashing method comprising the steps of:

holding a substrate having a resist mask formed on a low dielectric constant insulating film in a chamber of an ashing apparatus;

applying an RF electric power to activate an almost pure oxygen gas introduced in the chamber in order to perform ashing of the resist mask, while an RF electric power is applied to the substrate, thereby obtaining formation of a protective film on a surface of the low dielectric constant insulating film;

wherein a ratio (W_s/W_b) of the RF electric power (W_s) for activating the almost pure oxygen gas to the RF electric power (W_b) applied to the substrate is set so that the change rate of the dielectric constant of the low dielectric constant insulating film before and after ashing is 10 % or less; and

wherein the ratio (W_s/W_b) is controlled to be 5 or less.

As evidence of unpatentability of the claimed subject matter, the Examiner relies upon the following references:

Jeng	US 5,453,157	Sep. 26, 1995
Kropewnicki	US 6,440,864 B1	Aug. 27, 2002

The Examiner maintains¹ the rejection of claims 1-4, 8-11, 13, 14, 16-19, 22, and 23 under 35 U.S.C. § 103(a) as unpatentable over Kropewnicki and Jeng.

¹ We decline to consider Appellant's arguments directed to the Examiner's

Appellant argues the claims as a group. Accordingly, we select claim 1 as representative with the remaining claims standing or falling therewith. *See* 37 C.F.R. § 41.37(c)(1)(vii) (2009).

ISSUE

Has Appellant shown reversible error in the Examiner's determination that Kropewnicki teaches the oxygen gas feature and change rate of the dielectric constant feature of the claim 1 subject matter? We decide this issue in the negative.

FINDINGS OF FACT (FF)

1. Appellant does not specifically dispute the Examiner's finding that Kropewnicki teaches all of the features required by claim 1, except for the almost pure oxygen gas and change rate of the dielectric constant. (*Compare* Ans. 4-8 with Br. 7-10). Appellant does not contest the Examiner's combination of Jeng and Kropewnicki (Br. *generally*; Ans. 5).
2. The Specification states that

In the ashing method of the invention, normally an oxygen-containing gas is introduced into the chamber, and the RF electric power is applied to the chamber or the like to activate the gas, for example, to transform the gas into plasma. As the introduced oxygen-containing gas, as long as it does not exert a bad influence on the film quality or the like of the

objection to claims 1, 13, and 16-19 since Appellant's proper remedy is through a timely petition to the Director under 37 C.F.R. § 1.181 (2009) and not through an appeal to the Board. *See Manual of Patent Examining Procedure* (MPEP) §§ 1002 and 1002.02(c) (8th ed., Rev. 2, May 2004) and § 1201 (8th ed., Rev. 3, Aug. 2005).

insulating film (low dielectric constant film) formed on the substrate, the gas may be an almost pure oxygen gas, an ozone gas, a mixture thereof, or a mixture of either or both of these gases with a gas such as N₂ gas or CF₄ gas.

(Spec. 7).

3. The Specification states that

oxygen ions can be easily drawn to the substrate by application of the RF electric power to the substrate, and by that, an SiO film is formed on the surface of the interlayer insulating film, and it is conceivable that this film functions as a protection film to suppress the change in the film quality of the interlayer insulating film.

(Spec. 10). The Specification also states that the interlayer insulating film may be a low dielectric constant film "having a dielectric constant of, for example, about 3.5 or less. For example . . . an SiO₂ film." (Spec. 5).

4. Kropewnicki teaches that a cleaning gas may be activated or energized via a RF voltage in order to "both strip (or ash) remnant resist 50 and to remove etchant residue 60 from the substrate 30." (Kropewnicki, col. 5, ll. 13-26 and col. 6, ll. 11-65).
5. Kropewnicki broadly teaches that "the cleaning gas may comprise oxygen-containing gases, such as . . . O₂ . . . and *optionally* . . . NH₃," (Kropewnicki, col. 6, ll. 52-59) (emphasis added). In one embodiment, Kropewnicki teaches that that a cleaning gas may comprise oxygen and NH₃. (Kropewnicki, col. 6, l. 66 to col. 7, l. 34).
6. Kropewnicki teaches that the low K dielectric material may comprise a "silicon-containing organic polymer material having a low dielectric constant . . . [where] [b]y silicon-containing it is meant that the organic polymer material contains silicon or silicon compounds, such as . . .

SiO₂." (Kropewnicki, col. 8, ll. 1-9). Kropewnicki states that "the low K dielectric . . . [may] hav[e] a low dielectric constant, such as a dielectric constant less than about 3.2, and more preferably, less than 3.0" prior to cleaning. (Kropewnicki, col. 7, l. 61 to col. 8, l. 66).

PRINCIPLES OF LAW

As stated in *In re Best*:

where the Patent Office has reason to believe that a functional limitation asserted to be critical for establishing novelty in the claimed subject matter may, in fact, be an inherent characteristic of the prior art, it possesses the authority to require the applicant to prove that the subject matter shown to be in the prior art does not possess the characteristic relied on.

562 F.2d 1252, 1254-1255 (CCPA 1977) (*quoting In re Swinehart*, 439 F.2d 210 (CCPA 1971)). "This burden . . . is applicable to . . . process claims reasonably considered as possessing the allegedly inherent characteristics." *Best*, 562 F.2d at 1255.

ANALYSIS AND CONCLUSION

Appellant argues that Kropewnicki does not meet the feature "an almost pure oxygen gas" as the ashing gas because Kropewnicki "has an additive gas necessarily comprising NH₃ . . . [which] is *different* in gas type." (Br. 9). We disagree.

While Kropewnicki teaches, in one embodiment, that a cleaning (ashing) gas comprises oxygen and NH₃, Kropewnicki is not limited to such a cleaning gas. (FF 4-5). Indeed, as found by the Examiner, Kropewnicki broadly teaches that the cleaning gas "may comprise . . . O₂ . . . and *optionally* . . . NH₃," (FF 5).

Appellant has not shown error in the Examiner's finding that Kropewnicki teaches that its cleaning gas may comprise only O₂ (i.e., pure oxygen gas). (*See* Ans. 4 and 7). Accordingly, Appellant's argument is without persuasive merit.

Appellant next argues that

Kropewnicki . . . describes the preferred *starting* dielectric constant values of the Kropewnicki low dielectric . . . [n]owhere does Kropewnicki specify or suggest what the final dielectric constant should be, and therefore there is no basis to conclude what degree of dielectric change is or is not acceptable to Kropewnicki.

(Br. 8). In addition, Appellant argues that Kropewnicki "fails to disclose suppressing the change in the film quality of low-k film." (Br. 9). We disagree.

While Kropewnicki does not explicitly state the change rate of the dielectric constant, Kropewnicki, like Appellant, teaches that a low K dielectric material, which may comprise, *inter alia*, SiO₂, contacts the activated oxygen-containing gas, which may be pure O₂. (FF 2-3 and 4-6).

Thus, we agree with the Examiner's determination that there is a reasonable basis to believe that "the formation of a protective film [i.e., a SiO film] and all the claimed benefits derived therefrom [e.g., the change rate of the low dielectric constant insulating film] are . . . inherent features of Kropewnicki." (Ans. 8 and *see* FF 2-3).² *Best*, 562 F.2d at 1255. Therefore, the burden shifted to Appellant to show that Kropewnicki's protective film does not possess the claimed change rate properties. *Id.*

However, Appellant has not shown error in the Examiner's finding that Kropewnicki's material is the same as Appellant's such that it is reasonable to

² We note that a discussion of Jeng is unnecessary to resolve the issue raised.

expect that the change rate property would have been inherent in the material. Appellant has not provided any evidence or persuasive argument that Kropewnicki's protective layer does not possess the claimed change rate property. The burden is on Appellant to do so. *Best*, 562 F.2d at 1255.

As such, Appellant has not shown reversible error in the Examiner's determination that Kropewnicki teaches the oxygen gas feature and change rate of the dielectric constant feature of the claim 1 subject matter.

Accordingly, based on the factual findings and legal conclusions set forth in the Answer and above, we sustain the Examiner's rejection of claims 1-4, 8-11, 13, 14, 16-19, 22, and 23 under 35 U.S.C. § 103(a) over Kropewnicki and Jeng.

ORDER

The rejection made by the Examiner is sustained.

Accordingly, the Examiner's decision is affirmed.

TIME PERIOD

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a)(1)(2009).

AFFIRMED

ssl

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